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<u>L6</u>	(tile or acoustic tile or acoustical tile) and epichlorohydrin and cellulosic (fiber or fibre) and perlite	4	<u>L6</u>
<u>L5</u>	(tile or acoustic tile or acoustical tile) and epichlorohydrin and cellulosic (fiber or fibre) and expanded perlite	2	<u>L5</u>
<u>L4</u>	(tile or acoustic tile or acoustical tile) and epichlorohydrin and cellulosic (fiber or fibre)	52	<u>L4</u>
<u>L3</u>	(tile or acoustic tile or acoustical tile) and epichlorohydrin	506	<u>L3</u>
<u>L2</u>	tile or acoustic tile or acoustical tile	74720	<u>L2</u>
<u>L1</u>	4239519 [pn]	2	<u>L1</u>

END OF SEARCH HISTORY

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Composites of Polyvinyl Chloride—Wood Fibers: IV. Effect of the Nature of Fibers

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The suitability of different pulps (e.g. chemithermomechanical, kraft, tempure, temalfa, cotton, and sawdust) as well as various wood species (e.g. softwood, spruce; hardwood, aspen and birch) as the reinforcing filler for thermoplastic composites of PVC (two different grades) have been evaluated on the basis of mechanical properties. Mechanical properties of the non-treated composites were improved by the addition of a coupling agent [poly (methylene (polyphenyl isocyanate))] either in pure state or in solution, and by the pre-treatment of the fibers by encapsulation. The order of reactivity of the pulps varies widely with the change in the grades of thermoplastics and the quality of treatment. Due to the interference of properties of the pulps in the composites, the relative reactivity changes.

INTRODUCTION

Composites are one of the most important rapid growth materials conceived to meet the present demand of advanced technology (1). A good reason for gaining such popularity is that many of their physical and mechanical properties can be tailor-made through the judicious selection of filler and matrix. Numerous types of composites can be formulated by combining fillers and matrices (2, 3). Among these thermoplastics (4, 5) as a matrix and cellulose fibers (6-9) as filler are particularly attractive.

The properties of cellulose fiber-filled thermoplastic composites vary widely with the nature of thermoplastics and cellulose fibers.

Apart from the nature of thermoplastics, the properties of the composites vary with the change in the quality of cellulose fibers, e.g. fiber length, fiber-making technique, morphology, inherent physical and mechanical properties, origin, etc. The optimum fiber length, called "critical length", provides a number of advantages (10, 11), e.g. free of entanglement with each other, preservation of all fibrous characteristics, resistance to breakage during mixing, etc. Surface roughness helps fibers to develop a lock and key fit at an interface. Consequently, the force required to separate the adhering materials can be greatly increased. Different pulping techniques offer various ways to separate fibers from the wood chips (12) (e.g. sawdust is prepared by separating fibers mechanically, kraft pulp chemically, while both chemical and mechanical methods are used for chemithermomechanical pulp. Accordingly, surface

quality of the different pulps varies widely, e.g. the thermomechanical pulps (TMP) provides higher specific surface area compared to mechanical pulps (13).

Once again, depending on the origin, i.e. wood species, the morphology, mechanical properties, density and aspect ratio (average length to diameter ratio of the fibers) also change. For example, softwood fibers (spruce) are flexible compared to hardwood (aspen or birch). Again, between aspen and birch, the latter is denser. Furthermore, mechanical properties are affected by the pulping process even within the same species (14). Unfortunately, the comparative study of mechanical properties of thermoplastic composites containing different wood species in the form of various pulps is limited (15-19).

In the present study, attention was paid to evaluate the mechanical properties of composites of polyvinyl chloride and different cellulose fibers, e.g. cotton and wood fibers from softwood (spruce) and hardwood (aspen and birch) in the form of different pulps (e.g. CTMP, sawdust, kraft, tempure, and temalfa). The effect of fiber length as well as the performance of fibers in the presence of a coupling agent (PMPPI) have also been investigated.

MATERIALS

Thermoplastics

Polyvinyl chloride was supplied by two different companies:

- 1) PVC—(Barton) treated with 20 percent plasticizer, dioctyl phthalate (DOP); 1.3 percent an